Environmental profiles and trade-offs of dairy farming systems in New Zealand

Jeerasak Chobtang, Sarah McLaren, Danny Donaghy and Stewart Ledgard

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Massey University

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Presentation outline

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- Significance of NZ dairy sector
- Trends in NZ dairy systems
- Environmental profiles (case study 1)
- Environmental trade-offs (case study 2)
- Conclusions

Contribution to national economy

- ~3% of GDP
- ~25% of export revenue
- Direct and indirect jobs

NZ Government (2012)

Contribution to environmental degradation

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- Accounting for 40% of total GHG emissions from NZ agricultural sector
- Major contributors of leached nutrients, e.g. NO_3 and P
- Other impacts (have not been accounted for yet)

Trends in physical farm traits

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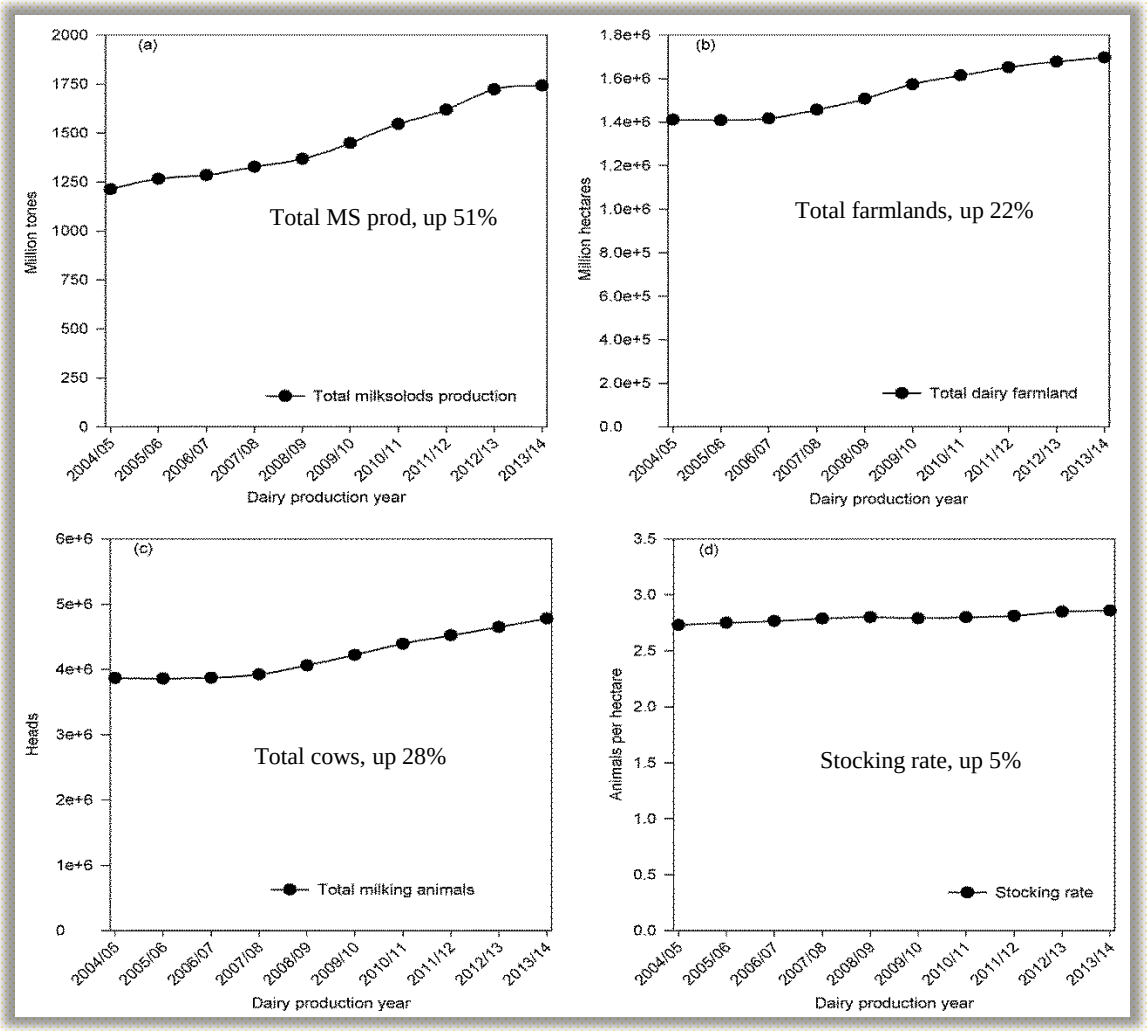
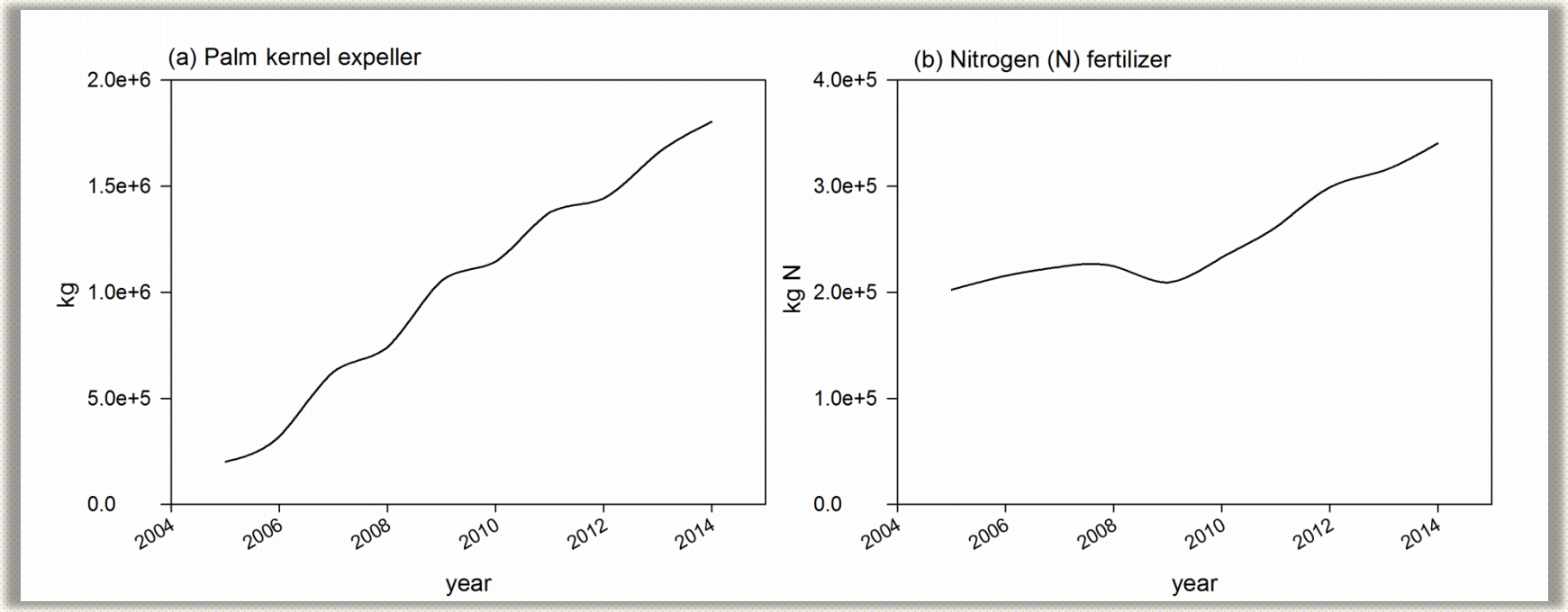


DairyNZ (2015)

Trends in use of off-farm inputs



StatisticsNZ (2015)

Overall objectives

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- To develop a better understanding of environmental impacts of current NZ dairy systems.
- To evaluate environmental performance of NZ dairy farm intensification methods.

Case study 1

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53 dairy farms in the Waikato region in 2010/11, representing the low-, medium- to high-input systems

Functional unit

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1 kg of fat- and protein-corrected milk (FPCM)

System boundary

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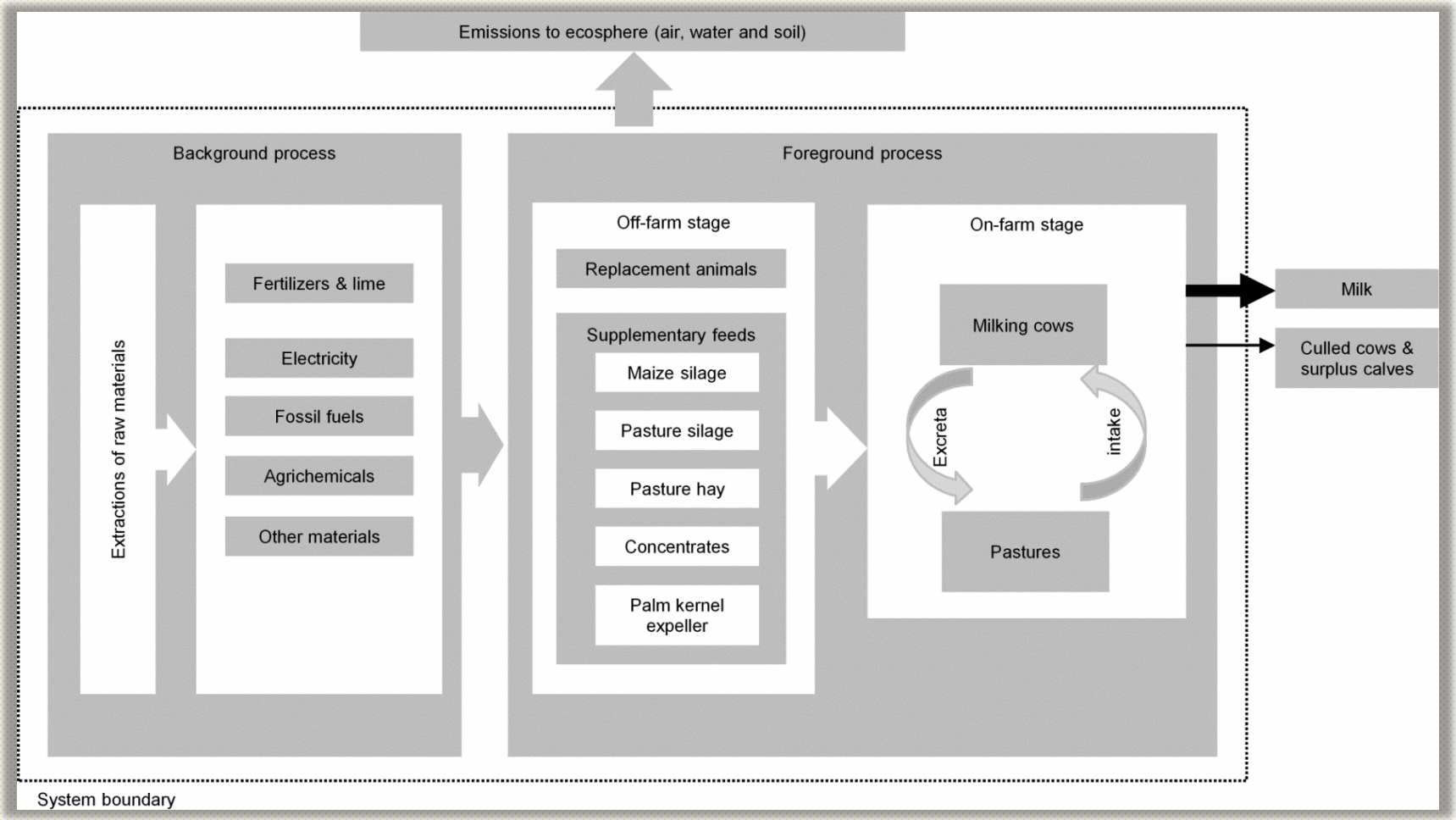

LCI Method

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- Recently developed LCI models
- Specific to NZ
- Globally accepted methods (in case lack of NZ specific LCI models)

LCIA

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12 out of 15 recommended impact categories were included.

CC	IR	TEP
ODP	PM	FEP
Non-cancer	POFP	MEP
Cancer	AP	Ecotox

Environmental hotspots

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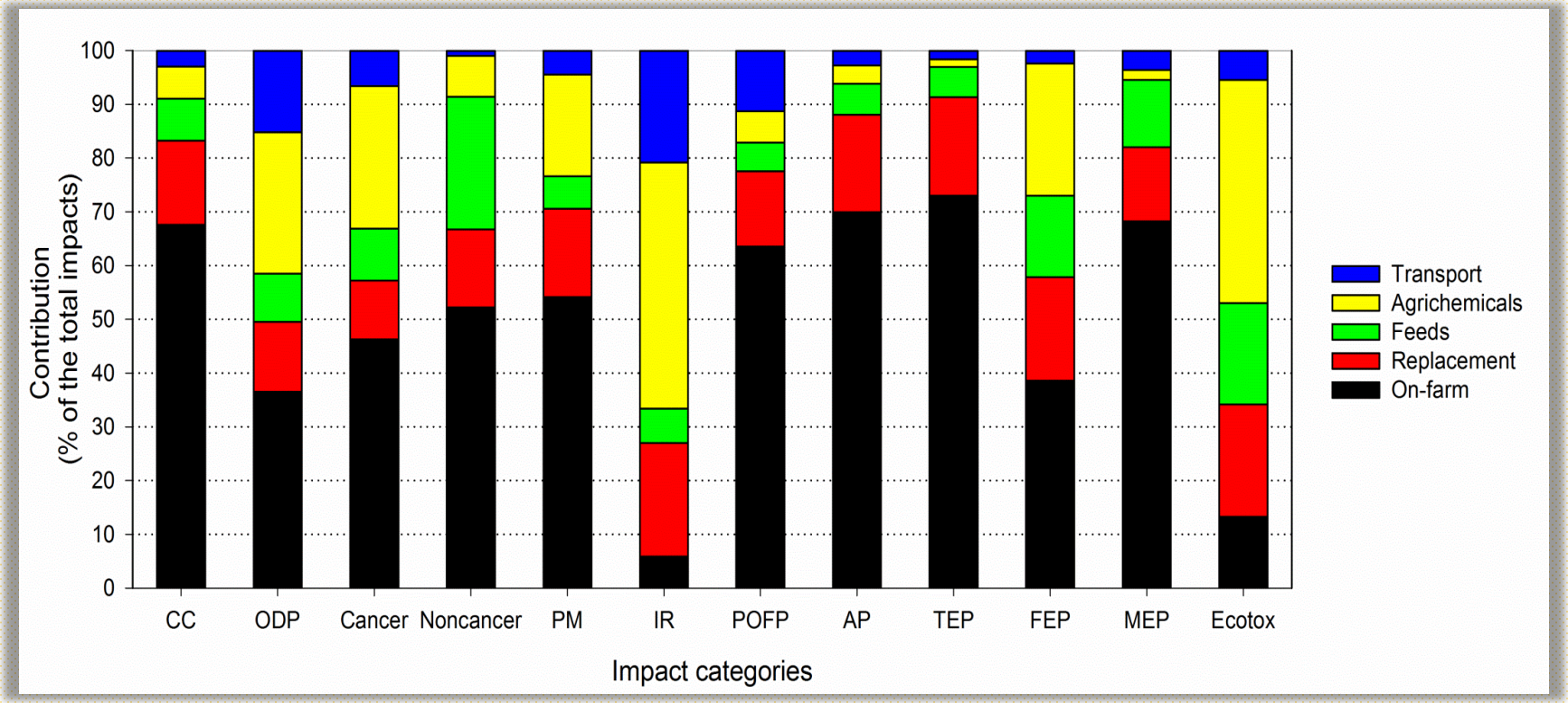

- *On-farm*: emissions associated with on-farm operation and milking cows
- *Replacement*: emissions associated with the rearing of replacement animals
- *Feeds*: emissions associated with the production of brought-in feed supplements for use on dairy farms
- *Agrichemicals*: emissions associated with the manufacturing of agrichemicals for use on dairy farms
- *Transport*: emissions associated with the transportation of inputs for use on dairy farms

Contributing substances

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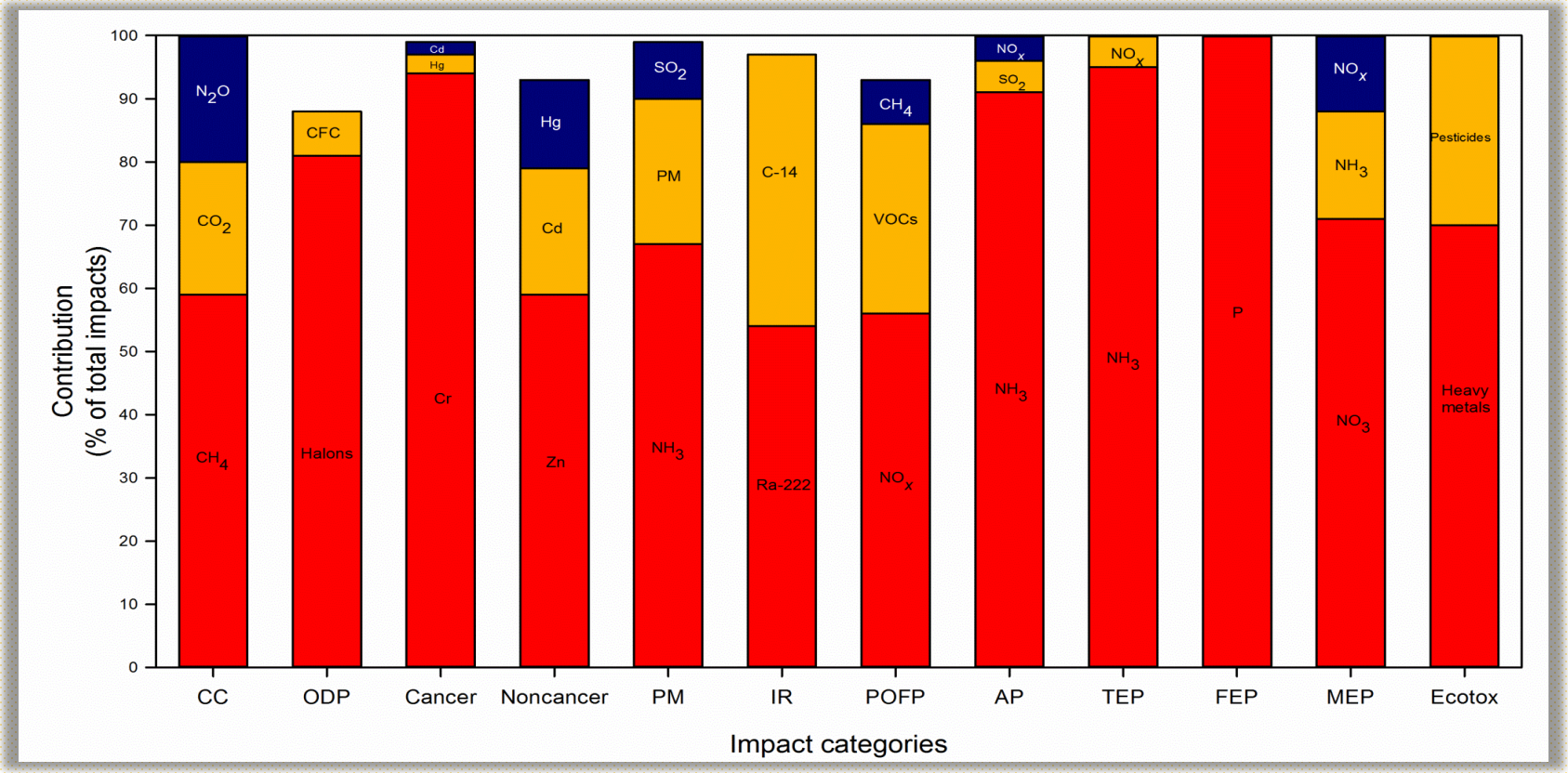

Case study 2

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- Two intensification options aiming at increasing milk production per ha
- Through increased stocking rate (animals per ha)
- Similar farm performance/productivity

Two dairy farming intensification options

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1) Increased use of nitrogen fertilisers to boost on-farm pasture production (N-fertiliser scenario)
2) Increased use of brought-in (off-farm) maize silage (MS scenario)

LCA method

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1) System boundary: cradle-to-farm gate
2) FU: 1 kg FPCM
3) LCI method: recently developed models/factors
4) LCIA: 12 recommended characterisation models

Environmental trade-offs

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- 4 indicators were less than 2% different: ODP, Cancer, POFP and FEP
- For N-fertiliser scenario, 6 indicators were worse than MS scenario: CC (8%), PM (16%), IR (6%), AP (16%), TEP (16%) and MEP (11%)
- For MS scenario, 2 indicators were worse than the N-fertiliser : Non-cancer (6%) and Ecotox (20%)

Contribution analysis

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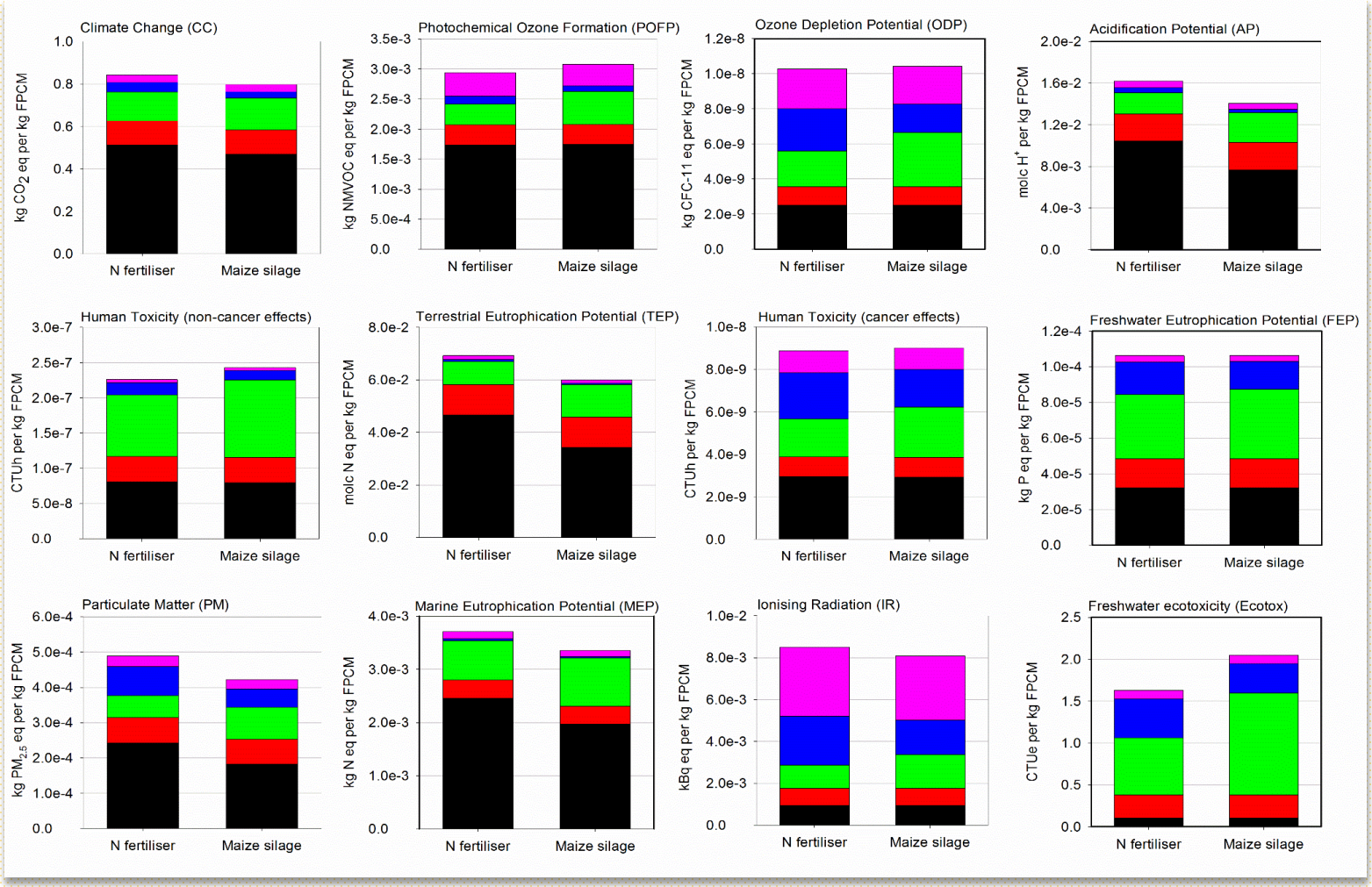

Conclusions

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- Dairy systems contributes to a range of environmental impacts.
- Contributions of both on-farm and off-farm stages are significant.
- Comprehensive environmental assessment prevents effects of environmental shifting.
- Accounting for multiple environmental indicators improves comprehensive sustainability of dairy systems.

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Environmental profiles and trade-offs supports identification of appropriate improvement options towards environmental sustainability of NZ dairy system.

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Thank you